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Sir:

Applicants have claimed priority under 35 U.S.C. § 119 of European Application No. 99200914.2 filed March 2, 1999. In support of this claim, a certified copy of said application is submitted herewith.

No fee or certification is believed to be due for this submission. Should any fees be required, however, please charge such fees to Winston & Strawn LLP Deposit Account No. 50-1814.

Respectfully submitted,

Date

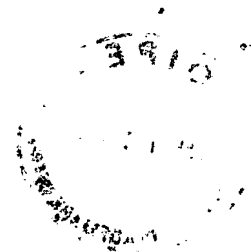
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Patentanmeldung Nr. Patent application No. Demande de brevet n°

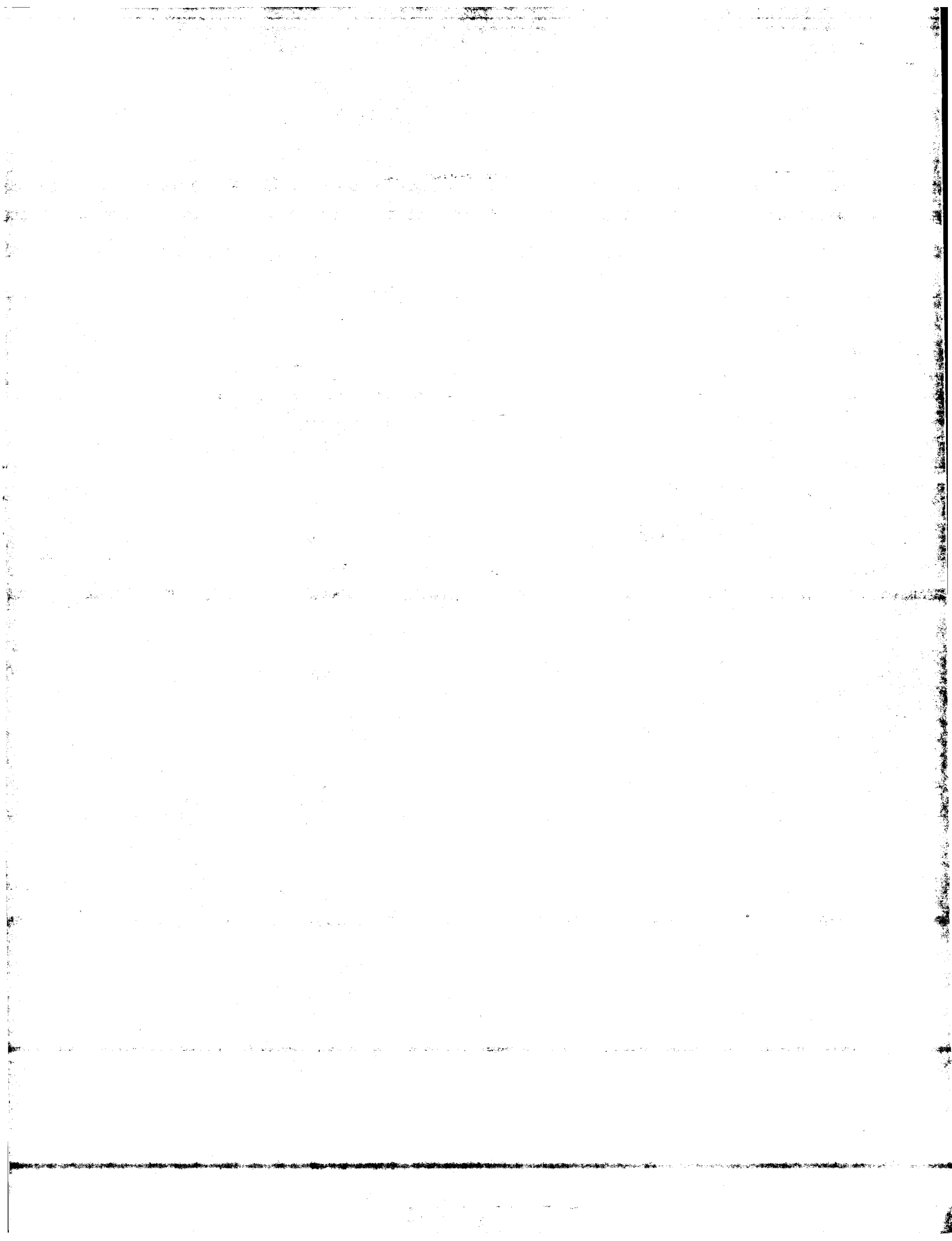
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Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

Le Président de l'Office européen des brevets
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R C van Dijk





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Anmelder/Applicant(s)/Demandeur(s):

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Bezeichnung der Erfindung/Title of the invention/Titre de l'invention:
(Falls die Bezeichnung der Erfindung nicht angegeben ist, siehe Beschreibung.
If no title is shown please refer to the description.
Si aucun titre n'est indiqué se referer à la description.)

Expanded snack product with high milk solids content

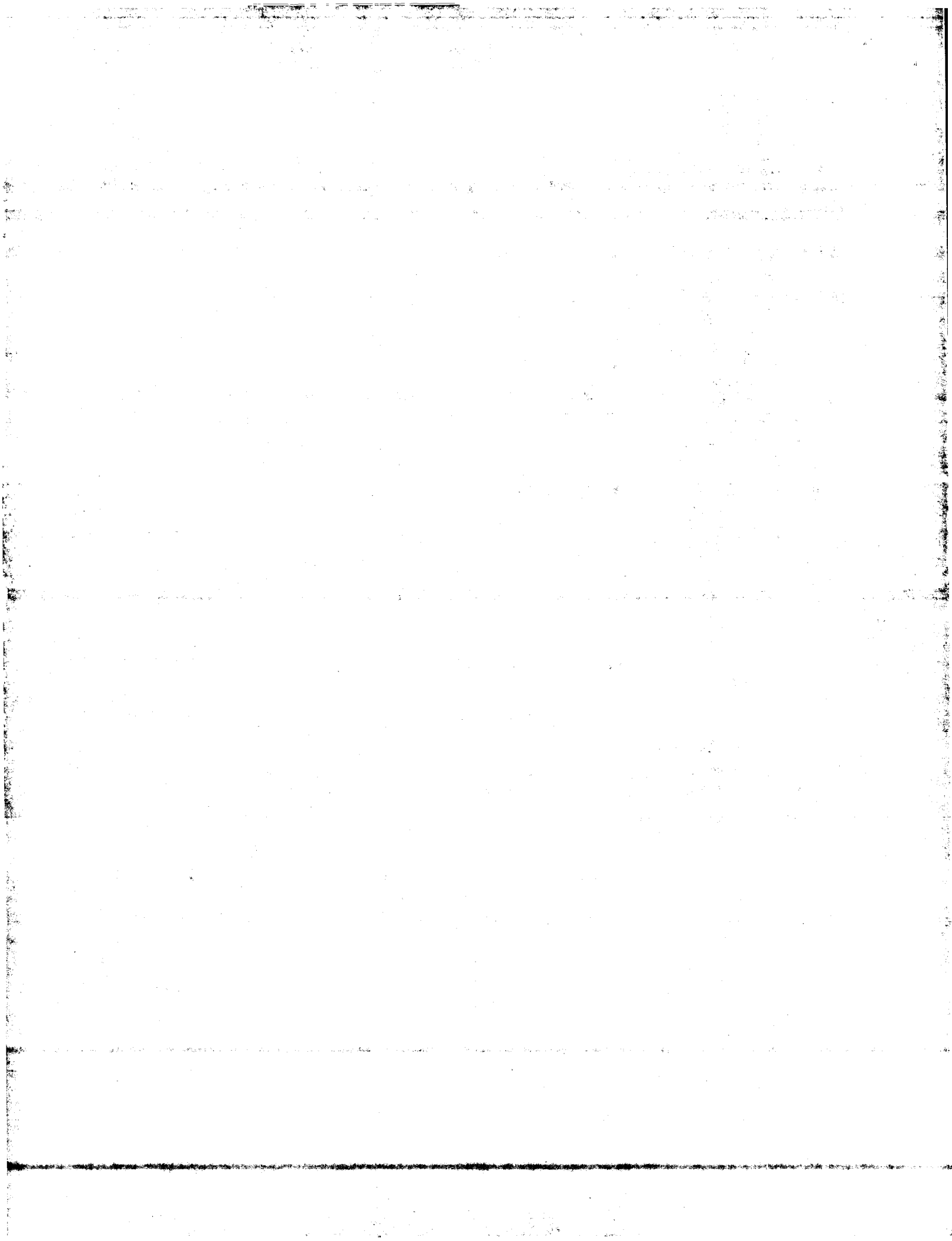
In Anspruch genommene Priorität(en) / Priority(ies) claimed /Priorité(s)
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Snack product

The present invention relates to a cooked-extruded-expanded snack product, and to a process for manufacturing such a
5 snack product.

US4650685 (Persson et al.) discloses a biscuit comprising agglomerated granules of a cooked-extruded base coated with a binder, the base comprising from 40 to 80 parts by weight
10 of cereal flour, up to 20 parts sucrose and from 0.5 to 3 parts of oil or fat, and the binder comprising from 8 to 30 parts by weight of sucrose and/or mixtures of glucose and its polymers.

15 JP01174322 (QP CORP) discloses a drop or cookie for babies and infants obtained by baking a dough consisting of starch, saccharides and milk, containing a powder of fruit juice but no egg material.

20 US4044159 (Lutz) discloses a ready-to-eat expanded cereal product in the form of thin flakes, suitable for the feeding of junior-age infants, obtained by cooking-extruding-expanding a moist blend comprising cereal grain, slicing the expanded rope of cooked-extruded blend into
25 flakes and drying the flakes.

WO89/04121 (HEINZ SCHAAF OHG) discloses a process for manufacturing cereals, especially for babies, by cooking-extruding a mixture of cereal material, vegetable and/or
30 fruits with a partial amount of sugar and milk, cutting the expanded rope of cooked-extruded mixture into pieces having a large surface, spraying an aqueous suspension of sugar and milk onto the just cut, hot and moist pieces, coating the moistened pieces with a remaining part of components in
35 powder form and drying the coated pieces.

WO93/17592 (SCHAAF TECHNOLOGIE GMBH) discloses a process and an apparatus for cooking-extruding-expanding vegetable and/or fruit containing cereals, in which expansion is carried out in a large expansion zone provided for after an extrusion zone and before a cutting zone.

A first object of the present invention is to provide a cooked-extruded-expanded snack product mainly comprising an amylaceous material and milk solids, which has a fine, porous, crunchy, smooth and melt-in-the-mouth texture while being dietetically valuable, as well as a process for manufacturing such a snack product.

A second object of the present invention is to provide a cooked-extruded-expanded snack product which may be coated with a sugar based coating, especially a coating further comprising milk solids.

A third object of the present invention is to provide a cooked-extruded-expanded snack product which may be filled with a fruit, vegetable or cream based filling.

To this end, the present cooked-extruded-expanded snack product has a porous texture and a specific weight of from 60 to 180 g/l and it comprises, in % by weight, from 5.5 to 22% of milk solids non fat, from 2.5 to 10% of milk fat and/or vegetable fat, from 55 to 80% of amylaceous material, up to 15% of sugar and from 1.0 to 8.0%, preferably from 1.0 to 3.0% of residual water.

The present process for manufacturing a snack product consists of cooking-extruding-expanding at 120 to 170°C under 40 to 160 bar for 5 to 50 s a mixture comprising, in parts by weight, from 5.5 to 22 parts of milk solids non fat, from 2.5 to 10 parts of milk fat and/or vegetable fat, from 55 to 80 parts of amylaceous material, up to 12 parts

of sugar, and added water up to a water content of from 11 to 18% by weight of the mixture, thus obtaining a rope of a thermo plastic mass having a porous texture, cutting the rope into pieces and optionnally drying them down to a residual water content of from 1.0 to 3.0%.

In the present context, the expression "being dietetically valuable" may be understood as designating a snack product based on amylaceous material especially comprising, in % by weight, from 5.5 to 22% of milk solids non fat and from 2.5 to 10% of milk fat and/or vegetable fat, that means a snack product based on amylaceous material which is rich in protein and calcium.

However, as a whole, beside a few percent of each of residual water, ash and dietary fibers, the present snack product may generally comprise, in % by weight, from about 6 to 18% of protein, from about 60 to 80% of available carbohydrate and from about 2.5 to 12% of fat, for example.

It has surprisingly been found that problems encountered especially in the matter of expansion and texture of the snack product while trying to achieve the above mentioned object of the present invention were best solved with the snack product and the process as above defined.

It has especially been found that with a preferred high content of milk solids, namely of from more than 16% of whole milk solids, which means from more than about 11% milk solids non fat and from more than about 5% milk fat, it is still possible to obtain an expanded snack product which has a fine, porous, crunchy, smooth, melt-in-the-mouth and not hard texture.

The present snack product thus comprises from 5.5 to 22%, preferably from more than 11 to 22% of milk solids non fat,

from 2.5 to 10%, preferably from more than 5 to 10% of milk fat and/or vegetable fat, from 55 to 80% of amylaceous material, up to 15% of sugar and from 1.0 to 8.0%, preferably from 1.0 to 3.0% of residual water.

5

The present snack product may further comprise up to 3% of additional calcium, preferably in form of calcium carbonate, in addition to the calcium already present in the milk solids non fat, for example.

10

The snack product may also further comprise added vitamins, oligoelements and sodium chloride, for example.

15

The milk solids non fat may be powdered skimmed milk, for example.

20

The milk fat and/or vegetable fat may be butter oil and/or vegetable oil or fat which may act as lubricating agent in the cooking-extrusion process, for example.

The amylaceous material may be a cereal flour, a starch and/or maltodextrin, for example.

25

The cereal flour may be wheat, barley, rice and/or corn, for example.

30

The starch may be a native starch from wheat, barley, rice, tapioca, potato and/or corn, especially waxy corn, for example.

The sugar may be sucrose, dextrose and/or fructose, for example.

35

The present snack product may be eaten as such, or after having been coated with a sugar based coating, or after

having been filled with a fruit, vegetable or cream based filling, for example.

5 Depending on the way it is intended to be eaten, the present snack product may have different shapes such as a shape of simple granules intended to be coated with a sugar base coating and agglomerated into a biscuit, a shape of fruits, vegetable or familiar items such as star, flower, heart, square or loop, intended to be coated with a sugar
10 base coating and to be eaten with the fingers especially by toddlers but also by infants or adults, or a hollow shape of tube or cup intended to be filled with a fruit, vegetable or cream based filling, for example.

15 An adequate coating may have a milk solids content which is lower, similar to or even more important than the milk solids content of the snack product itself, for example.

20 An adequate filling may have an Aw of from between 0.2 to 0.5, for example.

For carrying out the present process for manufacturing a snack product, a mixture is prepared which comprises, in parts by weight, from 5.5 to 22 parts, preferably from more
25 than 11 to 22 parts of milk solids non fat, from 2.5 to 10 parts, preferably from more than 5 to 10 parts of milk fat and/or vegetable fat, from 55 to 80 parts of amylaceous material, up to 12 parts of sugar, and added water up to a water content of from 11 to 18%, such a water content being
30 adequate for obtaining a correct expansion after cooking-extruding the mixture.

The mixture may further comprise up to 3 parts of additional calcium, preferably in form of calcium
35 carbonate, in addition to the calcium already present in the milk solids non fat, for example.

The mixture may also further comprise added vitamins, oligoelements and sodium chloride, for example.

- 5 The mixture may be prepared by first mixing together powdery components to obtain a dry mix and then mixing together the dry mix and liquid or fluid components.

10 This mixing step may be carried out in a first mixing section of a traditional food extruder, especially a twin screw extruder, for example.

15 Cooking the mixture may then be carried out in subsequent sections of the extruder where the mixture is heated, compressed and sheared so that it forms a cooked thermo plastic mass.

20 The thermo plastic mass may be extruded by having it pushed by the extruder screw or twin screw through the openings of a die provided for at an end of the extruder.

25 The die may have one or more circular openings having of from 2 to 5 mm in diameter, for example. The die openings may also have different, fancy shapes such as star, ring, half moon, flower, heart, square, loop or banana having a size, especially a length or a diameter of from about 5 to about 25 mm, for example.

30 The thermo plastic mass may be expanded by extruding it through the die into an open space at ambient temperature and at atmospheric pressure, for example.

35 Water is lost in form of steam escaping the thermoplastic mass during expansion so that the rope thus obtained has a porous texture and may have a water content of from 4 to 8%, for example.

In a preferred embodiment of the present process,
compressed nitrogen is injected into the plastified mass
just before extruding it. Nitrogen injection may be carried
5 out under a pressure of from about 35 to 160 bar, at a rate
of from 0.1 to 0.6 g nitrogen per kg of mass, for example.

Most surprisingly, the cooked-extruded thermoplastic mass
does not expand to a greater degree under the effect of
10 nitrogen injection but on the contrary to a lesser degree.
This is because the injected nitrogen not only increases
the number of bubbles within the expanded rope of cooked-
extruded thermoplastic mass but also cools down the mass
before it is extruded. A fine porous texture may be
15 obtained in this way which stands in contrast with a rather
coarse porous texture which may be obtained without
nitrogen injection.

The step of cutting into pieces the thus obtained rope of
20 expanded thermoplastic mass may be carried out by a two or
more blade cutter rotating adjacent to the die openings,
for example.

The optional step of drying the pieces, preferably down to
25 a residual water content of from 1.0 to 3.0% by weight, may
be carried out on a belt drier with hot air, for example.

In order to optionally coat the present snack product with
a sugar based coating, a slurry may be sprayed onto the
30 snack product, for example. The slurry may comprise, in
parts by weight, from 30 to 60 parts of sugar, up to 32
parts of whole milk powder, up to 60 parts of fruit pulp or
concentrate, up to 10 parts of cocoa powder and added water
up to a water content of from 20 to 30%, for example.

In the slurry, the sugar may be sucrose, fructose, dextrose and/or raw cane sugar, for example.

5 The possible step of coating the snack product by spraying thereon a slurry having the composition disclosed above may be carried out in a cylindrical tumbler rotating around its generally horizontal axis and being provided inside with spraying nozzles. Preferably located in an upper part of the cylindrical internal space defined by the tumbler wall,
10 such nozzles may spray the slurry downwards onto the tumbled snack product, for example.

Then, the just coated snack product may be dried again to a residual water content of from 1.0 to 3% by weight on a
15 belt drier with hot air, for example.

The possible filling of a snack product having a hollow shape of tube or cup may be carried out by coextrusion, for
20 example.

The snack product thus obtained, possibly coated or filled may be conditioned in a packing providing for its protection against humidity, such as a packing made of a film with aluminium foil, for example.

25 The following examples are given as illustration of embodiments of the snack product and embodiment of the process for its manufacture according to the present invention: The parts and percentages are by weight.

30

Example 1

For manufacturing a snack product having a heart shape, which was to be eaten with the fingers by toddlers, a
35 mixture was prepared which had the following composition, (in parts, except added water):

wheat flour	72
waxy corn starch	6
whole milk powder (26% fat)	20
butter oil	2
added water, up to a water content of	12%

For preparing the mixture, the powders were first mixed together to obtain a dry mix. The dry mix, oil and added
 5 water were then mixed together in the extruder. The mixture obtained in this way was cooked-extruded-expanded with the aid of a BC-72 type CLEXTRAL twin screw extruder having a screw diameter of 88 mm and a total processing length of 900 mm.

10 Cooking-extrusion was carried out at 135°C under 140 bar for 30 s, the two intermeshing screws rotating at 460 rpm. The cooked thermoplastic mass obtained in this way was extruded through a die having three heart shaped outlet
 15 openings or orifices about 7 mm in height and 7 mm in width.

The thermoplastic mass was extruded into ambient air and immediately cut with a two blade cutter rotating adjacent
 20 to the opening at 2300 rpm.

The heart shaped snack product obtained in this way expanded after cutting so that it was about 20 mm in length and about 20 mm in width. It had a water content of about
 25 7.6%. It had a specific weight of 97 g/l.

The heart shaped snack product was then dried with hot air on a belt dryer to a residual water content of 2.5%.

Meanwhile a slurry had been prepared which had the following composition (%):

sucrose	20
whole milk powder (26% fat)	12
banana juice concentrate	28
banana puree	12
water	28

5 For preparing the slurry, the components were mixed together in a double walled tank while being heated to about 50°C.

10 In a tumbler 80 cm in diameter and 150 cm in length, the slurry was sprayed while still hot onto the tumbling snack product by means of 5 spray nozzles, at a rate of 65 kg of slurry for 150 kg of snack product per hour.

15 The freshly coated snack product was then dried with hot air on a belt dryer to a residual water content of 1.5%.

20 The coated snack product had a heart shape and the taste of banana. It had a specific weight of 140 g/l, a fine, porous, crunchy, smooth and melt-in-the-mouth texture and it could be eaten with the fingers by toddlers. As a whole it had the following composition (%):

protein	13.0
available carbohydrate	73.9
fat	7.7
dietary fibers	1.8
ash	2.5
water	1.1

Example 2

For manufacturing a snack product having a tubular shape, a mixture was prepared which had the following composition,
 5 (in parts, except added water):

corn semolina	49
wheat flour	15
waxy corn starch	10
crystal sugar	12
skimmed milk powder	8
butter oil	6
added water, up to a water content of	12%

For preparing the mixture, the powders were first mixed together to obtain a dry mix. The dry mix, oil and added
 10 water were then mixed together in the extruder. The mixture obtained in this way was cooked-extruded-expanded with the aid of a BC-45 type CLEXTRAL twin screw extruder having a screw diameter of 55 mm and a total processing length of 1200 mm.

15 Cooking-extrusion was carried out at 153°C under 50 bar for 30 s, the two intermeshing screws rotating at 350 rpm.

The extruder was equipped with a die having a circular
 20 opening 4.5 mm in diameter and a concentric annular opening 8 mm in diameter and 1 mm in thickness.

Nitrogen was injected into the thermoplastic mass at a
 25 screw processing length of 1030 mm, under 37 bar and at a rate of 80 g/h.

The cooked thermoplastic mass thus obtained was extruded into ambient air through the annular opening while a cream

-based filling having an Aw of 0.4 was coextruded through the circular opening.

5 The tubular rope of cooked-extruded-expanded thermoplastic mass filled with a cylindrical rope of coextruded cream filling was cooled down rapidly in order to solidify. It was cut into pieces or sticks about 100 mm in length.

10 The tubular shaped snack product itself, without filling, was about 15 mm in-diameter and had a wall thickness of about 3-5 mm. It had a specific weight of 110 g/l, a residual water content of 7.5% and a fine, porous, crunchy, smooth and melt-in-the-mouth texture.

Claims

1. A snack product having a porous texture and a specific weight of from 60 to 180 g/l and comprising, in % by weight, from 5.5 to 22% of milk solids non fat, from 2.5 to 10% of milk fat and/or vegetable fat, from 55 to 80% of amylaceous material, up to 15% of sugar and from 1.0 to 8.0% of residual water.
2. A snack product according to claim 1, comprising from more than 11 to 22% of milk solids non fat and from more than 5 to 10% of milk fat and/or vegetable fat.
3. A snack product according to claim 1, comprising from 1.0 to 3.0 of residual water.
4. A process for manufacturing a snack product consisting of cooking-extruding-expanding at 120 to 170°C under 40 to 160 bar for 5 to 50 s a mixture comprising, in parts by weight, from 5.5 to 22 parts of milk solids non fat, from 2.5 to 10 parts of milk fat and/or vegetable fat, from 55 to 80 parts of amylaceous material, up to 12 parts of sugar, and added water up to a water content of from 11 to 18% by weight of the mixture, thus obtaining a rope of a thermo plastic mass having a porous texture and cutting the rope into pieces.
5. A process according to claim 4, in which the mixture comprises from more than 11 to 22 parts of milk solids non fat and from more than 5 to 10 parts of milk fat and/or vegetable fat.
6. A process according to claim 4, further comprising drying the pieces down to a residual water content of from 1.0 to 3.0%.

Abstract

5 A cooked-extruded-expanded dietetically valuable snack product mainly comprising an amylaceous material and milk solids, which has a fine, porous, crunchy, smooth and melt-in-the-mouth texture while being rich in protein and calcium.

